On-Line Documentation of Patient Care Orders

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ABSTRACT

The INFORMM NIS (Information Network For On-line Retrieval & Medical Management Nursing Information System) provides on-line documentation of patient care orders. These orders, generated by the nurse or the physician, prescribe direct patient care and do not include interdepartmental orders such as laboratory, radiology, or pharmacy. The order charting functions support charting efficiency by defaulting previous responses so that the user enters only updates to earlier findings or new data. Available in tables maintained by NIS staff, charting responses provide decision support by suggesting valid results for each order. Using point-of-care devices, nursing staff chart patient data that are immediately available for review by all authorized members of the health care team. These data are printed automatically on computer-generated chart forms every twenty-four hours, but may be printed also on demand. Additionally, the patient data report, containing patient data entered on-line in the sixteen or twenty-four hours immediately preceding the print request, provides a summary that is useful for nurses' report and physicians' rounds.

INTRODUCTION

In this era of fiscal constraint and the resultant "down-sizing" of institutions, cost-effectiveness can be provided by computer applications designed to enhance the efficiency of health care professionals, the timely communication and storage of patient data, and the measurement of patient outcome achievement. However, a literature search for on-line documentation systems yielded few anecdotal reports and fewer systematic studies, often with conflicting findings.

According to the literature, on-line documentation systems provide the following improvements in charting: accuracy, legibility, completeness, timeliness, decision support, and quality [1,2,3,4,5]. Manual and automated charting systems have been compared in terms of nursing time. Authors variously report that on-line charting decreases, increases, and does not affect nursing time spent in documentation activities [1,2,3,4,5]. In terms of patient care, automated systems are reported to increase or decrease time spent in nurse-patient contact [1,3,4]. At the completion of the pilot phase, the effects, including the impact upon nursing time, of on-line documentation are being experienced at The University of Iowa Hospitals and Clinics.

THE UNIVERSITY OF IOWA HOSPITALS AND CLINICS (UIHC)

The UIHC is an 881-bed tertiary-level health care facility providing services to approximately 2,500 patients each day. The most recent annual data reveal more than 483,300 ambulatory care visits and 35,000 patient admissions. Of the hospital staff complement of 7,460 members, the Department of Nursing includes 1,400 registered nurses, 55 advanced practice nurses, 60 licensed practical nurses, and 330 nursing assistants.

At the UIHC, the INFORMM system operates on an IBM 3090-500J with 126 billion characters of on-line storage. A locally distributed network contains more than 1,500 cathode ray terminals (CRTs), 260 personal computers (PCs), and 250 terminal printers that include IBM 3812 page printers installed on the inpatient care units to produce chart-quality documents on demand. In order to accommodate point-of-care charting, additional CRTs were installed in or near the patient rooms.

Available to more than 2,300 nursing users, the patient care planning system accounts for a daily average of approximately 50,000 transactions that has remained steady from implementation in 1988. With each pilot unit of on-line documentation of patient care orders (order charting), an average of 30,000 was added to the daily transaction volume. Unlike other systems' applications, the transaction volume did not decrease appreciably for the hours

from 5:00 p.m. to 8:00 a.m.; that is, nurses document 24-hours a day. While the total daily transaction volume on INFORMM exceeds 2 million, the average response time is less than 0.2 seconds.

INFORMM NURSING INFORMATION SYSTEM (NIS)

Developed entirely in-house at UIHC, the INFORMM NIS was implemented in 1988. The INFORMM NIS encompasses interdisciplinary communication of individualized patient care based upon current professional standards of care. In NIS patient care planning, patient critical data, patient problems/nursing diagnoses, patient discharge referral data, and patient care orders are entered and updated [6,7,8]. Generated by the nurse or the physician, these direct care orders do not include interdepartmental orders such as laboratory, radiology, and pharmacy. The patient care planning data generate the patient acuity profile as a system by-product. Developed and maintained by nursing personnel over the last ten years, the NIS database contains content specific to patient populations, patient care units, and therapeutic modalities.

The INFORMM NIS is being developed and implemented in three major phases. In Phase I, Patient Care Planning was installed on 41 general inpatient care units. Currently, Phase II: Patient Care Documentation is being designed and established on the same general inpatient care units. Phase II involves revision of documentation practices as well as replacement of existing manual documentation and creation of new chart forms. Following an integrated and logical development plan, each computer-generated chart document is being designed, piloted, and implemented separately.

At this time, three computer-generated chart documents are in use: the patient problem/nursing diagnosis form, the patient discharge referral form, and the order notes form. During Phase III of the INFORMM NIS, Patient Care Planning and Documentation will be enhanced and implemented on the ambulatory care units.

PREPARATION FOR ORDER CHARTING: DATABASE REORGANIZATION

In order to provide charting functionality, each order requires charting parameters. In the effort to provide unit-specific content to satisfy users, many variations of the initial 304 orders were created. For example, there were scores of dressing change orders, e.g., dressing change: saline-soaked fine mesh gauze; dressing change: dry coarse mesh gauze; wound and drainage characteristics. In addition, each order could include a 100-character free-text order note containing nursing data defaulted by the author and/or patient-specific data entered by the user.

Using our data archive of the previous year, patient orders were reviewed to determine the order variations and the note field contents. After an examination of multiple orders, it was discovered that authors and users included both details about the order and parameters for charting. Using dressing change as an example, the order details included items such as dressing location, (e.g., right leg), dressing method (e.g., wet to dry), dressing solution (e.g., normal saline) and dressing supply (e.g., fine mesh gauze). For charting parameters, the dressing change order included items such as dressing weight; drainage type, color, odor, and amount; wound width, length, depth, and edges.

Considering the archival data, the structure of each order was revised to include sixteen order modifiers: four order details and twelve charting parameters. Several checks against the archival file indicated that these modifiers would be sufficient for the remaining orders. Since the on-line order database remained in use throughout this reorganization, orders in all groups had to be individually updated to reflect the specifics and defaults of the original order. Consequently, the database maintenance transaction volume increased from a monthly average of 6,000 to 100,000.

As a result of enhancing each order to include four order details and sixteen charting parameters, the number of patient care orders in the database decreased from 3,122 to 430. However, the NIS database expanded to include more than 300 order details with nearly 5,000 options and 740 charting parameters with nearly 4,000 responses.

PREPARATION FOR ORDER CHARTING: ELECTRONIC SIGNATURE

Although already computer-generated, the cumulative problem/nursing diagnosis form and one-time patient discharge referral form were manually signed. For computer-generation of the order notes and order grid, electronic signature was essential to identify the many caregivers involved in a patient's

daily care and charting. In the state of Iowa, electronic signature requires the entry of the user password at both function initiation and completion as well as a monthly password update by each user. In order to minimize the impact upon the pilot of order charting, electronic signature mechanisms were implemented for all users six months before the initial pilot.

PREPARATION FOR ORDER CHARTING: EDUCATION AND TRAINING

The education for order charting consists of three sessions. All users attend a preliminary thirty-minute session on the changes due to the order database reorganization, e.g., how to use order details, and the enhanced programming efficiencies for adding and updating orders and order groups. Two weeks prior to system implementation, the user attends a one-hour lecture-discussion session which describes the concepts of order charting, followed by a one-hour hands-on training session using a standardized case study. One week prior to implementation, the user participates in a two-hour practice session with content specific to the user's patient population. Although the two sessions of training and practice have been deemed essential by users, it is reassuring to note that untrained users who have been re-allocated for a shift to an on-line charting unit have been able to chart on-line with minimal assistance by a trained user.

ORDER CHARTING: OBJECTIVES

The objectives for on-line documentation of patient care orders were:

1) to capture on point-of-care devices and display patient data at the time of order completion and to provide a "to do" list of remaining orders;

2) to expedite order charting by defaulting previous responses, by facilitating repetitive charting, and by eliminating redundant charting;

3) to provide decision support for suggested charting parameters and valid responses and to alert the user to patient changes since the order was last charted;

4) to generate patient record documents and print-outs on demand on the patient care unit;

5) to capture individual and aggregate patient data for clinical, administrative, research, and quality improvement purposes.

ORDER CHARTING: IMPLEMENTATION

As occurs with most nursing applications, order charting is being implemented on the general inpatient care units in three waves: an initial pilot on three units, an expanded pilot on eleven additional representative units, and finally, hospital-wide implementation. Unlike the user reluctance demonstrated in the implementation of patient care planning, demand for order charting far exceeds resources in terms of system implementation, e.g., training sessions, database support, user support.

ORDER CHARTING: EVALUATION OF OBJECTIVES ACHIEVEMENT

On-line documentation of patient care orders has achieved its stated objectives and the users report that order charting is faster, easier, and more complete than with manual methods.

Real-Time Data Capture And Display

Patient data are captured at the time of order completion on point-of-care devices in or near the patient room and can be retrieved by authorized personnel from any device, including remote access. As determined by the Professional Nursing Practice committee, each order in the database has a charting authorization level indicating the minimal job classification required for carrying out and charting the order. In the charting application, the user's position classification in the Human Resource System is compared to the order authorization level so that a user can chart against only those orders appropriate to one's position. For example, only registered nurses can assess the patient's knowledge level and provide instruction whereas a nursing assistant can orient the patient to the unit. If additional notes are indicated, a 100-character comments field can be used for each order charted and a 500-character free-text summary note can be entered at any time.

Upon charting completion, a "to do" list of remaining orders is displayed. Moreover, these

orders are color-coded in terms of order status: white (verified), pink (unverified), red (overdue--due prior to system sign-on time), yellow (skipped--not charted by a previous user). For retrieval, all charted order data are displayed in full text and trended in order profiles, either by individual order or in combinations such as vital signs and intake and output.

Charting Efficiency
Order charting is expedited by defaults of previous responses and a database of standard responses for each charting parameter. In the charting functions, the line beneath each order contains the last charted entry: date/time, charting parameters and responses. If the patient data have not changed from the last time, the user merely accepts the data to be copied to the selected charting time.

For repetitive charting of an order, this copy capability markedly reduces charting effort. For example, patient data obtained for neurologic monitoring do not change frequently for the stroke patient population. In this instance, the user merely accepts the previous data as valid for this charting time. Since charted data are entered only once and may be displayed and printed many times, redundant charting has been eliminated.

Decision Support
The order charting functions provide decision support for suggested charting parameters and responses for each order. The user simply selects the appropriate response to match the obtained patient data by entering a number, a portion of a word, or a (?) to query the database for the parameter responses. In addition to suggesting valid responses, the system has improved charting completeness. For instance, on an initial pilot unit, compliance for the documentation standard of pain ratings every four hours increased by 58% in one day.

For selected orders, on-line algorithms provide computation and enhanced decision support. For example, intake and output is automatically re-calculated immediately when any intake or output is entered. Moreover, for certain orders, the selected parameter responses are weighted and provide a total score that may suggest a user action. For example, the charted data for the fall risk potential order are weighted and totaled and a score of 7 or above prompts a message suggesting that the fall prevention intervention be selected for that patient. In addition, for the individual patient, the display of

the previous data alerts the user to patient changes since the last charting time.

Patient Record Documents And Print-outs
Order charting has replaced several manual flowsheets and free-text nurses' notes forms by providing computer-generated patient record documents and print-outs on demand on the patient care unit. Also, at approximately 4:00 a.m., the computer prints two record forms for each patient on the patient care unit: the order notes and the order grid. If the data are incomplete or not electronically signed, the chart forms are not printed and the unit is notified of the reason.

Each record form contains charted order data from the previous twenty-four hours, from one minute past midnight until midnight of that date. The order notes form contains, in chronological order, all patient data for orders, sorted by order groups, e.g., mobility, skin, and all free-text summary notes. On the order grid form, selected data are printed on a timeline for an overview of the salient charting events.

In addition to these two chart documents, the patient data report contains a timeline grid of order data with profiles of vital signs and intake and output for either sixteen or twenty-four hours preceding the print time. For the same time frame, result data, such as laboratory and radiology, which have been entered on-line in other departments, are printed as well. The patient data report, often printed prior to rounds or shift report, saves clinical data retrieval time and provides an integrated report of patient data for the immediately preceding time period.

Patient Data Archive
The capabilities to store and retrieve order charting data are identical to those for other NIS data. Patient and nursing data are retained on-line for forty-two days post-discharge, then transferred to an archival file. With requisite approvals, quality improvement studies and clinical and administrative research can be conducted on the active and archived data.

ORDER CHARTING: ENHANCEMENTS

At the completion of the expanded pilot phase on fourteen patient care units, several major enhancements have been designed, including additional displays, chart form revisions, and continued database reorganization. Particularly for

disciplines other than nursing, displays of patient data in profiles rather than by order or order groups have been well received. Therefore, several new profiles are being designed, such as a blood glucose profile combining bedside accuchek data and laboratory fasting blood sugar data with other related data. Revisions to the chart forms include combining the order notes and order grid on one form with patient data presented in profiles. Customization and enhancements based upon user requests have been facilitated by the in-house development of INFORMM NIS [9].

Although anecdotal reports and users' responses have been exceedingly positive, a systematic evaluation of order charting, including time studies, point-of-care documentation, and patient and health care team attitudes, is being conducted with baseline data from selected units pre-implementation and repeated measures at scheduled intervals post-implementation.

With the major reorganization of the order database complete, order groups are being converted to the Nursing Interventions Classification (NIC) as part of field site testing. As part of the field study for Nurse-sensitive Patient Outcomes (NOC), the outcomes database will be refined. The nursing diagnosis labels, defining characteristics, and etiologies will be refreshed as a result of the Nursing Diagnosis Extension Classification (NDEC) research. The development of the INFORMM NIS and the clinical use of the Nursing Minimum Data Set (NMDS) with the standardized terminologies of NIC, NOC, and NDEC will be concomitant and symbiotic with each component enriching the others and with all contributing to the national and international nursing knowledge database.

SUMMARY

While a systematic evaluation of the INFORMM NIS on-line charting system is in development, user reports from the pilot units indicate the improvements suggested by the literature. Moreover, nursing staff consistently note a decrease in time spent in charting activities: data entry, retrieval and dissemination. With point-of care documentation, many nurses state that more time is spent in contact with the patient. In addition to achieving its stated objectives, the INFORMM on-line documentation of patient care orders enhances patient care delivery while capturing clinical data critical to the examination and provision of quality patient care.

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